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Comparative study of Alcohol Content in two different market formulations by using the Specific Gravity Method

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Abstract : Background: Arishta are Ayurvedic preparation made by soaking the drugs either in powder form or in the form of decoction as Kaseya's with a solution of sugar and jaggery for a specified period, during which it undergoes the fermentation process which generates alcohol, thus facilitating the extraction of active principles present in the drug. Alcohol so generated is important as it serves as a preservative and also acts as a medium for the Ayurvedic herb to dissolve active principles. Apart from these benefits, it aids healthy digestion, relieves stress as well as gives us good sleep. Comparative study of alcohol content in two different market formulations i.e. Arishta by Dabur (A1) and Arishta by Baidyanath (A2) by using the specific gravity method. Two different marketed formulations of Arishta (A1 and A2) were used. Formerly distillation of two formulations was carried out and later from the distillate, the apparent specific gravity was determined via the specific gravity method.

Result: The Specific Gravity Method was used to compare the alcohol content in two market formulations, A1 and A2, revealing distinct differences in their apparent specific gravity values. The apparent specific gravity for A1 was 0.9791, while for A2 it was 0.955, indicating significant variations in their alcohol content.

Conclusion: Alcohol content is a necessary factor for the efficacy of Arishta formulation. However, the concentration of alcohol should be in the range of 5 - 10 % and therefore it is necessary to authenticate the marketed formulation.

Keywords: Arishta, kasayas, distillation, specific gravity.

I. INTRODUCTION

"Ayurveda " is composed of two words, ' ayus ' meaning 'life ' and 'Veda' meaning ' knowledge ' i.e. the "science of life". Ayurveda is regarded as the science of life and is based on the principle of "maintaining the health of the patient and helping to get relief from a diseased condition "1,2.

Ayurveda comprises of 8 branches. Ayurveda is based on the following principles that are - "Panchabhuta Siddhanta", "Tridosh Theory", and " Guna - Rasa-Virya- Vipaka -Prabhava Siddhanta".

The Panchabhuta Siddhanta is based on the five basic elements which are known as the Mahabhutas. The Tridosh Theory is based on the three essential factors that are Vatta, Pitta and Kapha. The Guna - Rasa - Virya - Vipaka -Prabhava Siddhanta is based on the five pharmacological dravya (drug substance) which are guna (quality), rasa (taste), virya (potency of active principle), vipaka (digestive products) and prabhava (pharmacotherapeutic action).

The Ayurvedic formulations are of much use for example - Ashokarhishta is used for heart disease and Khadiarishta is used for skin disease3,4,5.

Arishtas (Arishtam) are Ayurvedic medicines prepared by boiling medicinal herbs in water or decoction in the solution of sugar/jaggery (gur) and then fermenting the decoction for a specific period. They are also called the preparation of self-generated alcohol (alcoholic preparations). The alcohol so prepared is used for several purposes as a preservative, aids healthy digestion, relieves stress, etc. The base of Arishta is composed of alcohol and water, which gives it excellent bioavailability, which means it will get readily absorbed by the stomach and intestines and distributed throughout the body6.

Benefits of Arishta:-

Arishta has multiple benefits because of its composition. Some of them are as follows:

1. Arishta aids digestion to a great extent. This is necessary for healing because the digestive fire helps in the ideal functioning of the body.
2. The base of Arishta is alcohol and water. This combination makes it best to be absorbed by the stomach and intestines.
3. The quick distribution of Arishta is explained in Ayurveda as Vyavayi.
4. Kashayam can be stored for about 24 hours, but because of the use of alcohol in Arishta, it can be kept for longer.
5. The presence of sugar or jaggery in the formulation masks the bitter and astringent flavour of herbs, which gives a sweet-spicy taste.
6. Because of the fermentation process, Arishta can be stored for a very long period. 7. Due to the presence of spicy herbs, it boosts the digestion and metabolism7,8.

The widely used arista are listed as follows: -

a) Abhayarishta helps in digestion and is used for constipation and haemorrhoids.
b) Amrutharishta is used for the treatment of persistent fever, and malaria.
c) Ashokarishta is used for treating menstrual disorders and urinary disorders.
d) Ayaskrithy is used for diabetic patients.
e) Balarishta is effective for rheumatic disorders.
f) Dasamoolarishta is used in urinary disorders, gastric problems, nausea, taste loss, paleness, ascites, sterility in females, pneumonia, tuberculosis, piles, and jaundice.
g) Jeerakarishta is used to treat post-natal problems, cough, tuberculosis, and dyspnoea.
h) Kudajarishta is a formulation for diarrhoea with blood and mucus discharge and bleeding haemorrhoids.
i) Vasarishta is recommended for the treatment of asthma, dyspnoea, haematemesis, and aphonia.
j) Arjunarishta is used as a cardiotonic.
k) Draksharishta is best for constipation.
l) Ashwagandharishta is used for weakness and as an appetizer.
m) Muktakarishta is used for cholera.
n) Sirisharishta is used for poisonous bites.
o) Khadiarishta is used for cancer9,10.

I. RESEARCH METHODOLOGY

Two different marketed formulations were taken of Ashokarhishta i.e. A1 and A2. The alcoholic content was determined by the specific gravity method as this method helps to determine the alcohol concentration and gives the measurement of intermediate and final products.

Experimental Method:- The experiment was carried out separately for both the formulations11.

For A1(Dabur ashokarhishta)-

1. Initially the distillation of A1 was carried out in the distillation apparatus.
2. 25ml of the sample was taken from A1 and temperature was noted down at this volume. 3. An equal amount of water was added at the same temperature and it was put about to be distilled.
4. 2 ml less distillate was collected than the original volume of the sample.
5. Water was added up to 25ml to make up the volume.
6. The distillate must be clear.
7. Now the specific gravity of the distillate was determined by using the specific gravity method.
8. The weight of the empty specific gravity bottle was measured i.e. (w1).
9. The weight of a specific gravity bottle was measured along with pure water (w2).
10. The weight of a specific gravity bottle was measured along with distillate [w3].

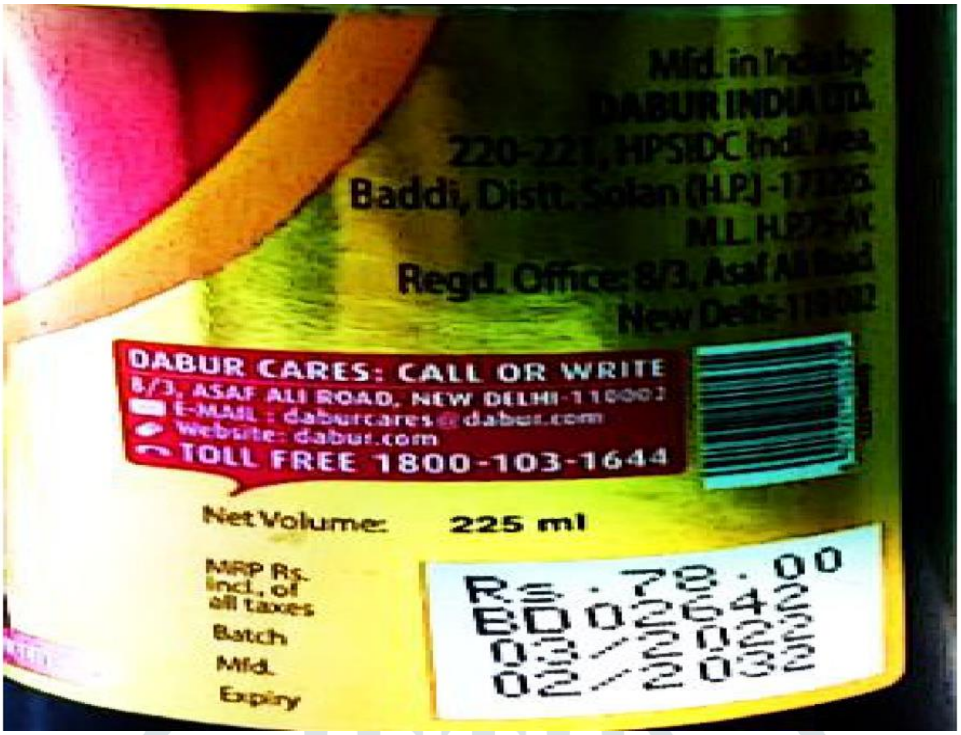

Fig 1: Dabur ashokarhishta

For A2(Baidyanath ashokarhishta)-

1. Initially the distillation of A2 was carried out in the distillation apparatus.
2. 25 samples were taken from A2 and temperature was noted down at this volume. 3. An equal amount of water was added at the same temperature and it was put about to be distilled.
4. 2 ml less distillate was collected than the original volume of the sample.
5. Water was added up to 25ml to make up the volume.
6. The distillate must be clear.
7. Now the specific gravity of the distillate was determined by using the specific gravity method.
8. The weight of the empty specific gravity bottle was measured i.e. (w1).
9. The weight of a specific gravity bottle was measured along with pure water (w2).
10. The weight of the specific gravity bottle was measured along with distillate (w3).

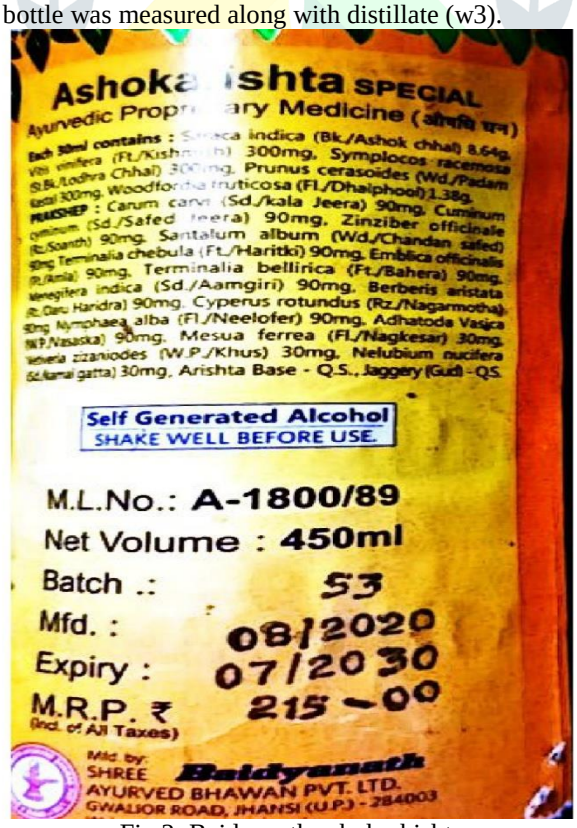

Fig 2: Baidyanath ashokarhishta

The methodology section outlines the plan and method that how the study is conducted. This includes the Universe of the study, a sample of the study, Data and Sources of Data, the study's variables, and analytical framework. The details are as follows;

IV. RESULTS AND DISCUSSION

In the comparative study of alcohol content in two different market formulations using the Specific Gravity Method, the results indicate distinct differences in the apparent specific gravity values obtained for A1 and A2 formulations. For A1, the apparent specific gravity was calculated as 0.9791, derived from the weights of the specific gravity bottle, distilled water, and distillate. Conversely, for A2, the apparent specific gravity was determined to be 0.955, based on similar weight measurements. These findings suggest that the alcohol content in the two formulations varies significantly, with A1 exhibiting a higher apparent specific gravity compared to A2. Such discrepancies highlight the importance of precise measurement techniques in evaluating alcohol content in different market formulations, emphasizing the need for accurate quality control measures in the production and analysis of alcoholic beverages.

The following calculations were carried out to obtain the alcoholic content.

For A1

Weight of empty specific gravity bottle (SGB), W1 = 23.95 g

Weight of SGB + distilled water, W2 = 47.42 g Weight of water (W2 -W1) = 23.47 g

Weight of SGB + distillate, W3 = 46.38 g Weight of distillate (W3-W1) = 22.98 g

Apparent specific gravity = Weight of distillate/Weight of water = 22.98/23.47 = 0.9791

For A2

Weight of empty specific gravity bottle (SGB), W1 = 23.95 g

Weight of SGB + distilled water, W2 = 47.42 g Weight of water (W2 -W1) = 23.47 g

Weight of SGB + distillate, W3 = 46.38 g Weight of distillate (W3 -W1) = 22.43 g

Apparent specific gravity = Weight of distillate/Weight of water = 22.435/23.47 = 0.955

Discussion

The research conducted on the quality assessment of different marketed brands of Ashok arista, an Ayurvedic formulation, highlighted crucial findings regarding alcohol content. The investigation revealed that while all preparations contained acceptable levels of alcohol (less than 12% v/v), some leading brands of Ashok arista had Alcoholic content exceeding acceptable limits. This discrepancy emphasizes the importance of stringent quality control measures in the herbal drug industry to ensure product safety and efficacy. Aristas like Ashokarishtais fermented decoctions in Ayurveda are known for their therapeutic benefits. These formulations are prepared by soaking medicinal herbs in a solution of sugar or jaggery to undergo fermentation, which aids in extracting active principles from the herbs. However, the lack of documentation and validation of these fermented decoctions poses a challenge in standardizing their quality. The research underscores the necessity for proper standardization procedures and regulatory oversight to enhance the quality of Ayurvedic preparations. Furthermore, Arishta is a hydroalcoholic liquid form in traditional Ayurvedic medicine, prepared through fermentation processes. In the context of the comparison between two market preparations of Arishta (A1 and A2) with Alcoholic content results of 0.20% for A1 and 0.33% for A2, it is evident that A2 has a slightly higher microbial load than A1. This variation underscores the importance of meticulous quality control measures to ensure that Ayurvedic formulations meet acceptable microbial standards for consumer safety and efficacy.

AOAC Chart

Table 1: AOAC chart[7]

Percentages by volume at 15.56°C (60°F) of ethyl alcohol corresponding to apparent specific gravity at various temperatures												
Apparent specific gravity	**15.56/15.56**	**20/20**	**22/22**	**24/24**	**25/25**	**26/26**	**28/28**	**30/30**	**32/32**	**34/34**	**35/35**	**36/36**
1.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.9999	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
98	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
97	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
96	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.24
95	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
94	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
93	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
92	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
91	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
90	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
89	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
88	0.80	0.80	0.80	0.80	0.80	0.80	0.79	0.79	0.79	0.79	0.79	0.79
87	0.87	0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.86	0.86	0.86
86	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
85	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99
84	0.07	0.07	0.07	0.07	0.07	0.07	1.06	1.06	1.06	1.06	1.06	1.06
83	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
82	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19
81	0.27	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.26
80	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.32	0.32	0.32	0.32	0.32
79	0.41	0.41	0.41	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39
78	0.48	0.48	0.48	0.47	0.47	0.47	0.47	0.46	0.46	0.45	0.46	0.46
77	0.54	0.54	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.52	0.52
76	0.61	0.61	0.61	0.60	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59
75	0.68	0.68	0.68	0.67	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66
74	0.75	0.75	0.75	0.74	0.74	0.73	0.73	0.73	0.73	0.72	0.72	0.72
73	0.82	0.81	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.79	0.79	0.79
72	0.88	0.88	0.88	0.87	0.87	0.87	0.86	0.86	0.86	0.85	0.85	0.85
71	0.95	0.95	0.95	0.94	0.94	0.94	0.93	0.93	0.93	0.92	0.92	0.92
70	2.02	2.02	2.02	2.01	2.01	2.01	2.00	2.00	2.00	0.99	0.99	0.99
69	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.06	2.05	2.05	2.05
68	0.16	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.13	0.12	0.12	0.12
67	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19
66	0.30	0.29	0.29	0.28	0.28	0.28	0.27	0.27	0.27	0.26	0.26	0.26
65	0.37	0.36	0.36	0.35	0.35	0.35	0.34	0.34	0.33	0.32	0.32	0.32
64	0.43	0.43	0.43	0.42	0.42	0.42	0.41	0.41	0.40	0.39	0.39	0.39
63	0.50	0.50	0.50	0.49	0.49	0.49	0.48	0.48	0.47	0.46	0.46	0.46
62	0.57	0.57	0.57	0.56	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53
61	0.64	0.64	0.64	0.63	0.63	0.63	0.62	0.61	0.60	0.60	0.59	0.59
60	0.71	0.70	0.70	0.70	0.70	0.70	0.69	0.68	0.67	0.67	0.66	0.66
59	0.78	0.77	0.77	0.77	0.77	0.77	0.76	0.75	0.74	0.74	0.73	0.73
58	0.85	0.84	0.84	0.83	0.83	0.83	0.82	0.82	0.81	0.81	0.80	0.80
57	0.92	0.91	0.91	0.90	0.90	0.90	0.89	0.88	0.87	0.87	0.86	0.86
56	0.99	0.98	0.98	0.97	0.97	0.97	0.96	0.95	0.94	0.94	0.93	0.93
55	30.06	3.05	3.05	3.04	3.04	3.04	3.03	3.02	3.01	3.01	3.00	3.00
54	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.09	0.08	0.08	0.07	0.07
53	0.20	0.19	0.19	0.18	0.18	0.18	0.17	0.16	0.15	0.15	0.14	0.14
52	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.21
51	0.34	0.33	0.33	0.32	0.32	0.32	0.31	0.30	0.29	0.28	0.27	0.27
50	0.41	0.40	0.40	0.39	0.39	0.39	0.38	0.37	0.36	0.35	0.34	0.34
49	0.49	0.47	0.47	0.46	0.46	0.46	0.45	0.44	0.43	0.42	0.41	0.41
48	0.56	0.54	0.54	0.53	0.53	0.53	0.52	0.51	0.50	0.49	0.48	0.48
47	0.63	0.61	0.61	0.60	0.60	0.60	0.59	0.58	0.57	0.56	0.55	0.55
46	0.70	0.68	0.68	0.67	0.67	0.67	0.66	0.65	0.64	0.61	0.62	0.62
45	0.77	0.76	0.75	0.74	0.74	0.74	0.73	0.72	0.70	0.69	0.68	0.68
44	0.84	0.83	0.82	0.81	0.81	0.81	0.79	0.78	0.77	0.76	0.75	0.75
43	0.91	0.90	0.89	0.88	0.88	0.88	0.86	0.85	0.84	0.81	0.82	0.82
42	0.99	0.97	0.96	0.95	0.95	0.95	0.93	0.92	0.91	0.90	0.89	0.89

Table 1: (*Continued*)

Percentages by volume at 15.56°C (60°F) of ethyl alcohol corresponding to apparent specific gravity at various temperatures												
Apparent specific gravity	**15.56/15.56**	**20/20**	**22/22**	**24/24**	**25/25**	**26/26**	**28/28**	**30/30**	**32/32**	**34/34**	**35/35**	**36/36**
41	4.06	4.04	4.03	4.02	4.02	4.02	4.00	0.99	0.98	0.97	0.96	0.96
40	0.13	0.11	0.10	0.10	0.09	0.09	0.07	4.06	4.05	4.04	4.03	4.03
39	0.20	0.18	0.17	0.17	0.16	0.16	0.14	0.13	0.12	0.11	0.10	0.10
38	0.28	0.26	0.25	0.25	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.17
37	0.35	0.33	0.32	0.32	0.31	0.30	0.28	0.27	0.26	0.25	0.24	0.24
36	0.42	0.40	0.39	0.39	0.38	30.7	0.36	0.35	0.33	0.32	0.31	0.30
35	0.50	0.48	0.47	0.46	0.45	0.44	0.43	40.2	0.40	0.39	0.38	0.37
34	0.57	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.47	0.46	0.45	0.44
33	0.64	0.62	0.61	0.60	0.59	0.58	0.57	0.55	0.54	0.53	0.52	0.51
32	0.71	0.69	0.68	0.67	0.66	0.65	0.64	0.63	0.61	0.60	0.59	0.58
31	0.79	0.77	0.76	0.75	0.74	0.73	0.72	0.70	0.68	0.67	0.66	0.65

LIST OF ABBRESIVATION:

i.e.- That is

A1- Arishta by Dabur

A2- Arishta by Baidyanath (A2)

W1- the weight of an empty specific gravity bottle

W2- the weight of the specific gravity bottle was measured along with pure water

W3- The weight of the specific gravity bottle was measured along with the distillate

SGB- Specific gravity bottle

AOAC- Association of Official Analytical Chemists

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CONFLICTS OF INTEREST:

There are no conflicts of Interest.

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